

Answer on Question #76846 – Math – Statistics and Probability

A population has a mean of 220 and a standard deviation of 80. Suppose a sample of size 100 is selected and \bar{x} is used to estimate μ .

Question

a. What is the expected value of \bar{x} ?

Solution

$$E(\bar{x}) = \mu = 220$$

Question

b. What is the standard deviation of \bar{x} ?

Solution

$$\sigma_1 = \frac{\sigma}{\sqrt{n}} = \frac{80}{\sqrt{100}} = 8$$

Question

c. What is the probability that the sample mean will be within ± 5 of the population mean?

Solution

$$z(215) = \frac{215 - 220}{80/\sqrt{100}} = -0.63$$

$$z(225) = \frac{225 - 220}{80/\sqrt{100}} = 0.63$$

$$p(215 < x < 225) = p(-0.63 < z < 0.63) = 0.7357 - 0.2643 = 0.4714$$

Question

d. What is the probability that the sample mean will be within ± 10 of the population mean?

Solution

$$z(210) = \frac{210 - 220}{80/\sqrt{100}} = -1.25$$

$$z(230) = \frac{230 - 220}{80/\sqrt{100}} = 1.25$$

$$p(210 < x < 230) = p(-1.25 < z < 1.25) = 0.8944 - 0.1056 = 0.7888$$